

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-185763

(43)Date of publication of application : 06.07.2001

(51)Int.Cl.

H01L 33/00

H01L 23/28

H01L 23/48

(21)Application number : 11-369374

(71)Applicant : TOSHIBA ELECTRONIC  
ENGINEERING CORP  
TOSHIBA CORP

(22)Date of filing : 27.12.1999

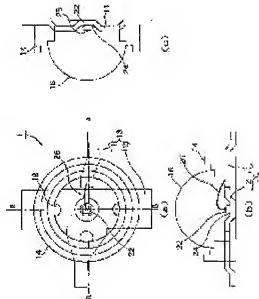
(72)Inventor : UCHIHARA TSUKASA  
TAMURA HIDEO  
SUGIZAKI MASAYUKI

## (54) OPTICAL SEMICONDUCTOR PACKAGE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an optical semiconductor package of a lead frame type which realizes low thermal resistance.

**SOLUTION:** This optical semiconductor package 1 is provided with a lead frame 13, a translucent member 16 and a light shielding resin molded member 14. The lead frame 13 consists of a metal segment 11 which mounts an optical semiconductor element 22 on a mounting region of a main surface and is electrically connected with the optical semiconductor element 22 through conductive adhesive agent 24, and a metal segment 12 electrically connected with the optical semiconductor element 22 through a metal wire 26. The light transmitting member 16 is formed of translucent resin and arranged so as to cover the optical semiconductor element 22. The light shielding resin molded member 14 is formed of light shielding resin, and has a bottom part retaining an inner lead part of the lead frame 13 and a side part retaining the translucent member 16. In the metal segment 12, a back region corresponding to the mounting region mounting the optical



semiconductor element 22 is exposed outside penetrating a bottom part of the light shielding resin molded member 14 and made a first heat dissipating region.

**\* NOTICES \***

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**CLAIMS**

---

[Claim(s)]

[Claim 1]An OPTO semiconductor device and a leadframe which mounts said OPTO semiconductor device in the principal surface, The 1st resin molded body allocated so that it might be molded with translucency resin and said OPTO semiconductor device might be covered, A pars basilaris ossis occipitalis which is molded with light blocking effect resin and supports an inner lead part of said leadframe, Have the 2nd resin molded body that has a flank which supports said 1st resin molded body, and said leadframe, An optical semiconductor package which is formed so that a field corresponding to a mounting region of said OPTO semiconductor device may penetrate a pars basilaris ossis occipitalis of said 2nd resin molded body among rear faces which counter said principal surface and it may expose outside, and makes the 1st radiating area and in which an outer lead part makes the 2nd radiating area.

[Claim 2]The 1st metal department connected with the 1st terminal of this OPTO semiconductor device while said leadframe carried said OPTO semiconductor device, Have the 2nd metal department connected by the 2nd terminal and metal wire of said OPTO semiconductor device, and said 1st metal department, The optical semiconductor package according to claim 1, wherein it is formed so that it may extend to the exterior towards differing mutually from said mounting region, and the outer lead part makes said two or more 2nd radiating areas.

[Claim 3]The optical semiconductor package according to claim 1, wherein said 1st metal department includes a metal block allocated so that said OPTO semiconductor device may be carried in the principal surface and the bottom may project from the bottom of said 1st resin molded body.

[Claim 4]Said 1st resin molded body is beforehand molded by lens shape from which optical directivity is obtained on an optic axis of said OPTO semiconductor device, The optical semiconductor package according to any one of claims 1 to 3 adhering to said leadframe and

said 2nd resin molded body via the 3rd resin molded body that covers said OPTO semiconductor device with said translucency resin, and is formed.

[Claim 5]The optical semiconductor package according to any one of claims 1 to 3, wherein said 1st resin molded body is molded using a mold so that lens shape from which optical directivity is obtained on an optic axis of said OPTO semiconductor device with said translucency resin may be made.

[Claim 6]The optical semiconductor package according to any one of claims 1 to 5, wherein said leadframe has a crevice which is formed in an inner lead part, and the side takes the lead low along with the other side, and makes an inclined plane in which light is reflected and where the bottom serves as said mounting region.

[Claim 7]The optical semiconductor package according to any one of claims 1 to 6, wherein said 2nd resin molded body has in a flank an inclined plane in which light is reflected in a plane of composition with said 1st resin molded body.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

[0001]

[Field of the Invention]Especially this invention relates to the structure of an optical semiconductor package of realizing low-ferver resistance, about an optical semiconductor package.

[0002]

[Description of the Prior Art]It explains referring to drawings for the optical semiconductor package by a Prior art.

[0003]Drawing 3 (a) is a front view showing an example of the conventional optical semiconductor package.

The figure (b) is an enlarged drawing of the field in the dashed line in (a).

[0004]The optical semiconductor package 50 shown in the figure is provided with the leadframe 53 which becomes by the two metal pieces 51 and 52, OPTO semiconductor device 22 which adhered on the leadframe 53 via the electroconductive glue 54, and the resin sealed body 56.

[0005]As OPTO semiconductor device 22 is shown in drawing 3 (b), a cathode is electrically connected to the metal piece 51 of a leadframe by the electroconductive glue 54, and the anode is electrically connected to the metal piece 52 of the leadframe 53 via the metal wire 26.

[0006]In the conventional optical semiconductor package as shown in drawing 3, OPTO semiconductor device 22 generates heat in proportion to an input current by energization. After conducting the generated heat to the electroconductive glue 54, it is conducted to the leadframe 53, and it is emitted to the open air after that. Although a part of heat is emitted to the open air via the sealing resin 56, since the leadframe 53 is generally formed with the metal

whose thermal conductivity is very good, most heat is emitted through the leadframe 53.

[0007]The characteristic of an OPTO semiconductor device deteriorates in the rise in heat by heat, and, as a result, the drawing efficiency of light falls. Conventionally, heat dissipation nature was raised, and in order to reduce the thermal resistance of a package and to cope with such a problem, the following methods have been adopted about the leadframe type package.

[0008]That is, the method of making width of a leadframe thick as the 1st method, the way thermal conductivity chooses a good thing about electroconductive glue as the 2nd method, the method to which the capacity of the whole package is made to increase as the 3rd method, etc. were used.

[0009]It was, also when not a leadframe type but a stem type with low thermal resistance of a package, etc. were used.

[0010]

[Problem(s) to be Solved by the Invention]However, the semiconductor device is asked for general more much more small and light-ization. According to these 1st and 3rd methods mentioned above on the other hand, the capacity of a package will become large. According to the 2nd method, a large effect is not expectable although the capacity of a package is not affected. In order that the unit price of parts may assemble many parts in a stem type package in addition to a high thing, it is unsuitable for mass production.

[0011]This invention is made in light of the above-mentioned circumstances, and the purpose is to provide the optical semiconductor package of the leadframe type which realizes low-fever resistance.

[0012]

[Means for Solving the Problem]This invention aims at solution of an aforementioned problem by the following means.

[0013]Namely, a leadframe which according to this invention is formed with an OPTO semiconductor device and metal and mounts this OPTO semiconductor device in the principal surface, The 1st resin molded body allocated so that it may be formed with translucency resin and the above-mentioned OPTO semiconductor device may be covered, The 2nd resin molded body that has a pars basilaris ossis occipitalis which is formed with light blocking effect resin and supports an inner lead part of the above-mentioned leadframe, and a flank which supports the 1st resin molded body of the above, A preparation and the above-mentioned leadframe are formed so that a field corresponding to a mounting region of the above-mentioned OPTO semiconductor device may penetrate a pars basilaris ossis occipitalis of the 2nd resin molded body of the above among rear faces which counter the above-mentioned principal surface and it may expose outside, and they make the 1st radiating area, An optical semiconductor package in which an outer lead part makes the 2nd radiating area is provided.

[0014]Since the 1st radiating area that a field corresponding to a mounting region of an OPTO

semiconductor device penetrates a pars basilaris ossis occipitalis of the 2nd resin molded body of the above among rear faces of the above-mentioned leadframe, and is exposed outside is made, In addition to an outer lead part of the above-mentioned leadframe, and surface area of the 1st resin molded body of the above, heat generated with an OPTO semiconductor device can be emitted outside from a field nearest to a heat source. Thereby, a substantially low optical semiconductor package is provided for thermal resistance.

[0015]Since both the 1st resin molded body of the above and the 2nd resin molded body of the above are formed with resin, a mutual root face has the outstanding adhesion. Thereby, penetration of moisture from the outside or an impurity can be prevented certainly.

[0016]The 1st metal department connected with the 1st terminal of this OPTO semiconductor device while the above-mentioned leadframe carried the above-mentioned OPTO semiconductor device, It has the 2nd metal department connected by the 2nd terminal and metal wire of the above-mentioned OPTO semiconductor device, and the 1st metal department of the above is good to be formed so that it may extend to the exterior towards differing mutually from the above-mentioned mounting region, and for the outer lead part to make two or more 2nd radiating areas of the above.

[0017]Since an outer lead part of the 1st metal piece of the above makes two or more 2nd radiating areas of the above, surface area of the 2nd radiating area of the above becomes large. As a result, heat which is generated in the above-mentioned mounting region and conducted via an inner lead part is efficiently emitted to the exterior. Thereby, thermal resistance can decrease further.

[0018]The 1st metal department of the above may include a metal block allocated so that the above-mentioned OPTO semiconductor device may be carried in the principal surface and the bottom may project from the bottom of the 1st resin molded body of the above.

[0019]Since the bottom of the above-mentioned metal block projects from the bottom of the 1st resin molded body of the above, while being able to emit still more efficiently heat generated with an OPTO semiconductor device, when a package is mounted in a substrate, a gap is formed between fields other than the bottom of the above-mentioned metal block, and a substrate. Thereby, via space in this gap, heat is still more efficient and is emitted.

[0020]As for the 1st resin molded body of the above, it is preferred to adhere to the above-mentioned leadframe and the 2nd resin molded body of the above via the 3rd resin molded body that is beforehand formed with lens shape from which optical directivity is obtained on an optic axis of the above-mentioned OPTO semiconductor device, covers the above-mentioned OPTO semiconductor device with the above-mentioned translucency resin, and is formed.

[0021]The 1st resin molded body of the above may be formed in one using a mold so that lens shape from which optical directivity is obtained on an optic axis of the above-mentioned OPTO semiconductor device with the above-mentioned translucency resin may be made.

[0022]As for the above-mentioned leadframe, it is desirable to have a crevice which it is formed in an inner lead part, and the side takes the lead low along with the other side, and makes an inclined plane in which light is reflected and where the bottom serves as the above-mentioned mounting region. Light from which it separated from an optic axis of the above-mentioned OPTO semiconductor device can be reflected by this, and an orbit parallel to an optic axis can be passed.

[0023]It is desirable to have in a flank an inclined plane in which light is reflected also about the 2nd resin molded body of the above in a plane of composition with the 1st resin molded body of the above. Also by this, it can separate from an optic axis of the above-mentioned OPTO semiconductor device, light which reached via a resin molded body of the 1st or 2nd \*\* of the above can be reflected, and an orbit parallel to an optic axis can be passed.

[0024]

[Embodiment of the Invention]Hereafter, it explains, referring to drawings for some of embodiments of the invention. In the following drawings, the same reference number is given to the same portion as drawing 3, and the explanation is omitted suitably.

[0025](1) Explain, referring to drawing 1 for the 1st embodiment \*\*\*\* and a 1st embodiment of the optical semiconductor package concerning this invention. As shown in the figure, the feature of this embodiment is at a point provided with the leadframe 13 which emits the heat generated with the OPTO semiconductor device in a horizontal direction and the direction of the bottom, and the light blocking effect resin molded body 14 which supports the translucency member 16 while holding this leadframe 13.

[0026]Drawing 1 is an explanatory view showing the optical semiconductor package 1 of this embodiment, and a sectional view [ in / (a) can be set in a top view and / in (b) / the A-A cutting plane of (a) ] and (c) show the sectional view in the B-B cutting plane of (a).

[0027]The optical semiconductor package 1 shown in drawing 1 is provided with the following. Leadframe 13.

OPTO semiconductor device 22.

Light blocking effect resin molded body 14.

Translucency resin molded body 16.

[0028]The leadframe 13 comprises the metal piece 12 which is the 1st metal department, and the metal piece 11 which is the 2nd metal department, as shown in drawing 1 (a). The metal piece 12 is formed in the shape of an abbreviated T shape of having an inner lead part and an outer lead part which extends a sliding direction and leftward in space from this inner lead part. The anchor hole 18 for improving the adhesion between the light blocking effect resin molded body and translucency resin molded body which are mentioned later is established in the border area of the inner lead part of the metal piece 12, and an outer lead part. The metal



piece 11 is formed with the approximately stripe shape arranged so that only prescribed distance may be separated by the metal piece 12 and the tip of an inner lead part may extend rightward [ space ]. Each can form these metal pieces 11 and 12 by press working of sheet metal or casting, and the outer lead part of each metal pieces 11 and 12 makes the 2nd radiating area.

[0029]As shown in the Drawing (a) and (b), it is bent perpendicularly and the metal piece 12 is formed in it so that the field except the component mount area of the center of an inner lead part and each end of an outer lead part may become higher than the bottom of a package. With such shape, each end of the component mount area of the metal piece 12 and an outer lead part will contact the principal surface of the substrate with which the optical semiconductor package 1 is mounted in each bottom and which is not illustrated, and fields other than this will be from the wiring on a substrate in an insulating state.

[0030]OPTO semiconductor device 22 is laid on the mounting region of the metal piece 12, and adheres to the principal surface of the metal piece 12 with the electroconductive glue 24. When the heat resistance of the light blocking effect resin molded body 14 mentioned later is taken into consideration as a material of the electroconductive glue 24, Ag (silver) paste is preferred. OPTO semiconductor device 22 is LED (Light Emitting Diode) in this embodiment, and it is electrically connected to the metal piece 12, one, for example, the cathode, of a terminal.

[0031]As for OPTO semiconductor device 22, other terminals, for example, an anode, are electrically connected to the metal piece 11 via the metal wire 26.

[0032]The light blocking effect resin molded body 14 constitutes the 2nd resin molded body in this embodiment, and the pars basilaris ossis occipitalis and the cylindrical flank are formed in one with light blocking effect resin. The metal pieces 11 and 12 which make the leadframe 13 by this, It is held by the flank of the light blocking effect resin molded body 14 in the border area of an outer lead part and an inner lead part, and an inner lead part is supported by the pars-basilaris-ossis-occipitalis principal surface of the light blocking effect resin molded body 14 except for the component mount area of the metal piece 12. The flank upper surface of the light blocking effect resin molded body 14 is formed so that it may have the shape which makes two or more steps which height decreases successively, as the central point is approached. The shape which the light blocking effect resin molded body 14 mentioned above can be easily formed by setting the leadframe 13 to a predetermined mold so that the principal surface may turn into the undersurface, and slushing light blocking effect resin in this mold.

[0033]The translucency resin molded body 16 constitutes the 1st resin molded body in this embodiment, and it is molded so that it may have the lens shape from which optical directivity is obtained on the optic axis of LED. The translucency resin molded body 16 is molded in this embodiment by laying the mold molded according to desired lens shape in the predetermined

step on the upper surface of a flank of the light blocking effect resin molded body 14, and slushing translucency resin. Since the anchor hole 18 is established in the metal piece 11 as mentioned above, when the translucency resin 16 pastes up with the light blocking effect resin molded body 14 via this, the translucency resin molded body 16 adheres strongly with the light blocking effect resin molded body 14. As a material of light blocking effect resin, resin with the refractive index near the lens itself, for example, gel silicon transparent resin, is used.

[0034]Molding of the translucency resin molded body 16, without restricting to a described method. For example, the hemisphere to which the optical property was adjusted is beforehand formed with translucency resin between LED, the same translucency resin as the material of this hemisphere is slushed to the height corresponding to the bottom of a hemisphere so that LED may be covered, and the hemisphere beforehand formed on it may be laid and it may be made to adhere. Without making it adhere in one with translucency resin, it may be filled up with dry nitrogen ( $N_2$ ), for example, and only a hemisphere may be made to adhere to the step to which the flank upper surface of the light blocking effect resin molded body 14 is equivalent.

[0035]According to the optical semiconductor package 1 of this embodiment, the element formation region rear-face side in the inner lead part of the leadframe 13 is exposed to the exterior of a package, and constitutes the 1st radiating area, Since it has the 2nd four radiating area that extends to the exterior of a package in the outer lead part of the leadframe 13, as compared with the conventional package, thermal resistance can be reduced substantially. Since the light blocking effect resin molded body 14 adheres with the translucency resin molded body 16 and supports this while the light blocking effect resin molded body 14 serves as a pedestal and holding the leadframe 13, it excels in an adhesive property and moisture and a pollutant can be certainly prevented from advancing from the exterior. Since two or more steps are provided in the flank upper surface of the light blocking effect resin molded body 14, the distance of the translucency resin molded body 16 and LED22 can be adjusted easily. the rear face of the leadframe 13 -- among them, since the field which does not contribute to heat dissipation directly is formed so that only prescribed distance may be isolated from the bottom of the translucency resin molded body 16, it does not bar the flexibility of a design of wiring on a substrate in mounting to a substrate.

[0036](2) Explain, referring to drawing 2 for a 2nd embodiment, next a 2nd embodiment of the optical semiconductor package concerning this invention.

[0037]Drawing 2 is an explanatory view of the optical semiconductor package 2 of this embodiment, and (a) is the top view, and (2) is a sectional view in the C-C cutting plane of (a).

[0038]In contrast with the optical semiconductor package 1 shown in drawing 1, the feature of the optical semiconductor package 2 shown in drawing 2 is in the structure of the leadframe

34.

[0039]That is, the optical semiconductor package 2 of this embodiment is provided with the metal block 33 and the metal piece 32 instead of the metal piece 12 shown in drawing 1. The metal block 33 is really formed in shape which loaded two disks of a concentric circle with which radii differ, a notch is provided so that the inclined plane S1 where the side becomes low toward a center may be made to a top disk part, and LED22 is laid in the bottom. LED22 adheres to the bottom of a notch with the electroconductive glue 24, and is electrically connected with the metal block 33. The pars basilaris ossis occipitalis of the metal block 33 has disc shape with a larger radius than a crowning, and the radius is the same in the translucency resin molded body 16 and abbreviation in this embodiment. The light blocking effect resin molded body 36 is formed so that the pars basilaris ossis occipitalis of the metal block 33 may project from the bottom. While the metal block 33 is connected to the wiring on the substrate which is not illustrated in the bottom with such shape, The heat generated in LED22 is efficiently emitted by the gap between the bottom and the substrate except a field corresponding to the big area of base of the metal block 33, and the mounting region of the light blocking effect resin molded body 36.

[0040]The light from which it separated from the optic axis of LED22 reflects by the inclined plane S1 formed in the notch of the crowning of the metal block 33, and it enters into the translucency resin molded body 16, and emanates to the exterior on an orbit almost parallel to an optic axis.

[0041]The inside has the inclination shape which becomes low toward a center, a reflector is applied to the surface S2, and the flank of the light blocking effect resin molded body 36 serves as a white glossy surface, as shown in drawing 2 (b). Therefore, the light from which it separated from the optic axis reflects, and this inclined plane S2 also emanates on an orbit parallel to an optic axis via the translucency resin molded body 16.

[0042]Although the cathode of LED22 had composition connected to wiring on a substrate via the metal block 33 in this embodiment, Without restricting to this, as shown in the dashed line of the figure, corresponding to the design of the substrate mounted, even if the top adjacent spaces of the metal block 33 and the tip part of the metal piece 32 are connected with the metal wire 27 and it connects with wiring on a substrate by the end of the package outside of the metal piece 32, it is easy to be natural.

[0043]

[Effect of the Invention]This invention does the following effects so as explained in full detail above.

[0044]Namely, since according to this invention a leadframe is held by a light blocking effect resin molded body, the field corresponding to an OPTO semiconductor device mounting region is exposed among the rear faces which counter the principal surface from the pars basilaris ossis occipitalis of the above-mentioned light blocking effect resin molded body and the 1st

radiating area is made, The heat generated with the above-mentioned OPTO semiconductor device is emitted outside at high efficiency. Thereby, the optical semiconductor package in which thermal resistance was reduced substantially is provided.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

TECHNICAL FIELD

---

[Field of the Invention]Especially this invention relates to the structure of an optical semiconductor package of realizing low-fever resistance, about an optical semiconductor package.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

PRIOR ART

---

[Description of the Prior Art]It explains referring to drawings for the optical semiconductor package by a Prior art.

[0003]Drawing 3 (a) is a front view showing an example of the conventional optical semiconductor package.

The figure (b) is an enlarged drawing of the field in the dashed line in (a).

[0004]The optical semiconductor package 50 shown in the figure is provided with the leadframe 53 which becomes by the two metal pieces 51 and 52, OPTO semiconductor device 22 which adhered on the leadframe 53 via the electroconductive glue 54, and the resin sealed body 56.

[0005]As OPTO semiconductor device 22 is shown in drawing 3 (b), a cathode is electrically connected to the metal piece 51 of a leadframe by the electroconductive glue 54, and the anode is electrically connected to the metal piece 52 of the leadframe 53 via the metal wire 26.

[0006]In the conventional optical semiconductor package as shown in drawing 3, OPTO semiconductor device 22 generates heat in proportion to an input current by energization. After conducting the generated heat to the electroconductive glue 54, it is conducted to the leadframe 53, and it is emitted to the open air after that. Although a part of heat is emitted to the open air via the sealing resin 56, since the leadframe 53 is generally formed with the metal whose thermal conductivity is very good, most heat is emitted through the leadframe 53.

[0007]The characteristic of an OPTO semiconductor device deteriorates in the rise in heat by heat, and, as a result, the drawing efficiency of light falls. Conventionally, heat dissipation nature was raised, and in order to reduce the thermal resistance of a package and to cope with such a problem, the following methods have been adopted about the leadframe type package.

[0008]That is, the method of making width of a leadframe thick as the 1st method, the way

thermal conductivity chooses a good thing about electroconductive glue as the 2nd method, the method to which the capacity of the whole package is made to increase as the 3rd method, etc. were used.

[0009]It was, also when not a leadframe type but a stem type with low thermal resistance of a package, etc. were used.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

EFFECT OF THE INVENTION

---

[Effect of the Invention]This invention does the following effects so as explained in full detail above.

[0044]That is, in this invention, a leadframe is held by a light blocking effect resin molded body, and among the rear faces which counter the principal surface, the field corresponding to an OPTO semiconductor device mounting region is exposed from the pars basilaris ossis occipitalis of the above-mentioned light blocking effect resin molded body, and makes the 1st radiating area.

Therefore, the heat generated with the above-mentioned OPTO semiconductor device is emitted outside at high efficiency.

Thereby, the optical semiconductor package in which thermal resistance was reduced substantially is provided.

---

[Translation done.]



\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

TECHNICAL PROBLEM

---

[Problem(s) to be Solved by the Invention]However, the semiconductor device is asked for general more much more small and light-ization. According to these 1st and 3rd methods mentioned above on the other hand, the capacity of a package will become large. According to the 2nd method, a large effect is not expectable although the capacity of a package is not affected. In order that the unit price of parts may assemble many parts in a stem type package in addition to a high thing, it is unsuitable for mass production.

[0011]This invention is made in light of the above-mentioned circumstances, and the purpose is to provide the optical semiconductor package of the leadframe type which realizes low-fever resistance.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**MEANS**

---

[Means for Solving the Problem]This invention aims at solution of an aforementioned problem by the following means.

[0013]Namely, a leadframe which according to this invention is formed with an OPTO semiconductor device and metal and mounts this OPTO semiconductor device in the principal surface, The 1st resin molded body allocated so that it may be formed with translucency resin and the above-mentioned OPTO semiconductor device may be covered, The 2nd resin molded body that has a pars basilaris ossis occipitalis which is formed with light blocking effect resin and supports an inner lead part of the above-mentioned leadframe, and a flank which supports the 1st resin molded body of the above, A preparation and the above-mentioned leadframe are formed so that a field corresponding to a mounting region of the above-mentioned OPTO semiconductor device may penetrate a pars basilaris ossis occipitalis of the 2nd resin molded body of the above among rear faces which counter the above-mentioned principal surface and it may expose outside, and they make the 1st radiating area, An optical semiconductor package in which an outer lead part makes the 2nd radiating area is provided.

[0014]Since the 1st radiating area that a field corresponding to a mounting region of an OPTO semiconductor device penetrates a pars basilaris ossis occipitalis of the 2nd resin molded body of the above among rear faces of the above-mentioned leadframe, and is exposed outside is made, In addition to an outer lead part of the above-mentioned leadframe, and surface area of the 1st resin molded body of the above, heat generated with an OPTO semiconductor device can be emitted outside from a field nearest to a heat source. Thereby, a substantially low optical semiconductor package is provided for thermal resistance.

[0015]Since both the 1st resin molded body of the above and the 2nd resin molded body of the above are formed with resin, a mutual root face has the outstanding adhesion. Thereby, penetration of moisture from the outside or an impurity can be prevented certainly.

[0016]The 1st metal department connected with the 1st terminal of this OPTO semiconductor

device while the above-mentioned leadframe carried the above-mentioned OPTO semiconductor device, It has the 2nd metal department connected by the 2nd terminal and metal wire of the above-mentioned OPTO semiconductor device, and the 1st metal department of the above is good to be formed so that it may extend to the exterior towards differing mutually from the above-mentioned mounting region, and for the outer lead part to make two or more 2nd radiating areas of the above.

[0017]Since an outer lead part of the 1st metal piece of the above makes two or more 2nd radiating areas of the above, surface area of the 2nd radiating area of the above becomes large. As a result, heat which is generated in the above-mentioned mounting region and conducted via an inner lead part is efficiently emitted to the exterior. Thereby, thermal resistance can decrease further.

[0018]The 1st metal department of the above may include a metal block allocated so that the above-mentioned OPTO semiconductor device may be carried in the principal surface and the bottom may project from the bottom of the 1st resin molded body of the above.

[0019]Since the bottom of the above-mentioned metal block projects from the bottom of the 1st resin molded body of the above, while being able to emit still more efficiently heat generated with an OPTO semiconductor device, when a package is mounted in a substrate, a gap is formed between fields other than the bottom of the above-mentioned metal block, and a substrate. Thereby, via space in this gap, heat is still more efficient and is emitted.

[0020]As for the 1st resin molded body of the above, it is preferred to adhere to the above-mentioned leadframe and the 2nd resin molded body of the above via the 3rd resin molded body that is beforehand formed with lens shape from which optical directivity is obtained on an optic axis of the above-mentioned OPTO semiconductor device, covers the above-mentioned OPTO semiconductor device with the above-mentioned translucency resin, and is formed.

[0021]The 1st resin molded body of the above may be formed in one using a mold so that lens shape from which optical directivity is obtained on an optic axis of the above-mentioned OPTO semiconductor device with the above-mentioned translucency resin may be made.

[0022]As for the above-mentioned leadframe, it is desirable to have a crevice which it is formed in an inner lead part, and the side takes the lead low along with the other side, and makes an inclined plane in which light is reflected and where the bottom serves as the above-mentioned mounting region. Light from which it separated from an optic axis of the above-mentioned OPTO semiconductor device can be reflected by this, and an orbit parallel to an optic axis can be passed.

[0023]It is desirable to have in a flank an inclined plane in which light is reflected also about the 2nd resin molded body of the above in a plane of composition with the 1st resin molded body of the above. Also by this, it can separate from an optic axis of the above-mentioned OPTO semiconductor device, light which reached via a resin molded body of the 1st or 2nd \*\* of the

above can be reflected, and an orbit parallel to an optic axis can be passed.

[0024]

[Embodiment of the Invention] Hereafter, it explains, referring to drawings for some of embodiments of the invention. In the following drawings, the same reference number is given to the same portion as drawing 3, and the explanation is omitted suitably.

[0025] (1) Explain, referring to drawing 1 for the 1st embodiment \*\*\*\* and a 1st embodiment of the optical semiconductor package concerning this invention. As shown in the figure, the feature of this embodiment is at a point provided with the leadframe 13 which emits the heat generated with the OPTO semiconductor device in a horizontal direction and the direction of the bottom, and the light blocking effect resin molded body 14 which supports the translucency member 16 while holding this leadframe 13.

[0026] Drawing 1 is an explanatory view showing the optical semiconductor package 1 of this embodiment, and a sectional view [ in / (a) can be set in a top view and / in (b) / the A-A cutting plane of (a) ] and (c) show the sectional view in the B-B cutting plane of (a).

[0027] The optical semiconductor package 1 shown in drawing 1 is provided with the following.  
Leadframe 13.

OPTO semiconductor device 22.

Light blocking effect resin molded body 14.

Translucency resin molded body 16.

[0028] The leadframe 13 comprises the metal piece 12 which is the 1st metal department, and the metal piece 11 which is the 2nd metal department, as shown in drawing 1 (a). The metal piece 12 is formed in the shape of an abbreviated T shape of having an inner lead part and an outer lead part which extends a sliding direction and leftward in space from this inner lead part. The anchor hole 18 for improving the adhesion between the light blocking effect resin molded body and translucency resin molded body which are mentioned later is established in the border area of the inner lead part of the metal piece 12, and an outer lead part. The metal piece 11 is formed with the approximately stripe shape arranged so that only prescribed distance may be separated by the metal piece 12 and the tip of an inner lead part may extend rightward [ space ]. Each can form these metal pieces 11 and 12 by press working of sheet metal or casting, and the outer lead part of each metal pieces 11 and 12 makes the 2nd radiating area.

[0029] As shown in the Drawing (a) and (b), it is bent perpendicularly and the metal piece 12 is formed in it so that the field except the component mount area of the center of an inner lead part and each end of an outer lead part may become higher than the bottom of a package. With such shape, each end of the component mount area of the metal piece 12 and an outer lead part will contact the principal surface of the substrate with which the optical semiconductor

package 1 is mounted in each bottom and which is not illustrated, and fields other than this will be from the wiring on a substrate in an insulating state.

[0030]OPTO semiconductor device 22 is laid on the mounting region of the metal piece 12, and adheres to the principal surface of the metal piece 12 with the electroconductive glue 24. When the heat resistance of the light blocking effect resin molded body 14 mentioned later is taken into consideration as a material of the electroconductive glue 24, Ag (silver) paste is preferred. OPTO semiconductor device 22 is LED (Light Emitting Diode) in this embodiment, and it is electrically connected to the metal piece 12, one, for example, the cathode, of a terminal.

[0031]As for OPTO semiconductor device 22, other terminals, for example, an anode, are electrically connected to the metal piece 11 via the metal wire 26.

[0032]The light blocking effect resin molded body 14 constitutes the 2nd resin molded body in this embodiment, and the pars basilaris ossis occipitalis and the cylindrical flank are formed in one with light blocking effect resin. The metal pieces 11 and 12 which make the leadframe 13 by this, It is held by the flank of the light blocking effect resin molded body 14 in the border area of an outer lead part and an inner lead part, and an inner lead part is supported by the pars-basilaris-ossis-occipitalis principal surface of the light blocking effect resin molded body 14 except for the component mount area of the metal piece 12. The flank upper surface of the light blocking effect resin molded body 14 is formed so that it may have the shape which makes two or more steps which height decreases successively, as the central point is approached. The shape which the light blocking effect resin molded body 14 mentioned above can be easily formed by setting the leadframe 13 to a predetermined mold so that the principal surface may turn into the undersurface, and slushing light blocking effect resin in this mold.

[0033]The translucency resin molded body 16 constitutes the 1st resin molded body in this embodiment, and it is molded so that it may have the lens shape from which optical directivity is obtained on the optic axis of LED. The translucency resin molded body 16 is molded in this embodiment by laying the mold molded according to desired lens shape in the predetermined step on the upper surface of a flank of the light blocking effect resin molded body 14, and slushing translucency resin. Since the anchor hole 18 is established in the metal piece 11 as mentioned above, when the translucency resin 16 pastes up with the light blocking effect resin molded body 14 via this, the translucency resin molded body 16 adheres strongly with the light blocking effect resin molded body 14. As a material of light blocking effect resin, resin with the refractive index near the lens itself, for example, gel silicon transparent resin, is used.

[0034]Molding of the translucency resin molded body 16, without restricting to a described method. For example, the hemisphere to which the optical property was adjusted is beforehand formed with translucency resin between LED, the same translucency resin as the material of this hemisphere is slushed to the height corresponding to the bottom of a

hemisphere so that LED may be covered, and the hemisphere beforehand formed on it may be laid and it may be made to adhere. Without making it adhere in one with translucency resin, it may be filled up with dry nitrogen ( $N_2$ ), for example, and only a hemisphere may be made to adhere to the step to which the flank upper surface of the light blocking effect resin molded body 14 is equivalent.

[0035]According to the optical semiconductor package 1 of this embodiment, the element formation region rear-face side in the inner lead part of the leadframe 13 is exposed to the exterior of a package, and constitutes the 1st radiating area. Since it has the 2nd four radiating area that extends to the exterior of a package in the outer lead part of the leadframe 13, as compared with the conventional package, thermal resistance can be reduced substantially. Since the light blocking effect resin molded body 14 adheres with the translucency resin molded body 16 and supports this while the light blocking effect resin molded body 14 serves as a pedestal and holding the leadframe 13, it excels in an adhesive property and moisture and a pollutant can be certainly prevented from advancing from the exterior. Since two or more steps are provided in the flank upper surface of the light blocking effect resin molded body 14, the distance of the translucency resin molded body 16 and LED22 can be adjusted easily. the rear face of the leadframe 13 -- among them, since the field which does not contribute to heat dissipation directly is formed so that only prescribed distance may be isolated from the bottom of the translucency resin molded body 16, it does not bar the flexibility of a design of wiring on a substrate in mounting to a substrate.

[0036](2) Explain, referring to drawing 2 for a 2nd embodiment, next a 2nd embodiment of the optical semiconductor package concerning this invention.

[0037]Drawing 2 is an explanatory view of the optical semiconductor package 2 of this embodiment, and (a) is the top view, and (2) is a sectional view in the C-C cutting plane of (a).

[0038]In contrast with the optical semiconductor package 1 shown in drawing 1, the feature of the optical semiconductor package 2 shown in drawing 2 is in the structure of the leadframe 34.

[0039]That is, the optical semiconductor package 2 of this embodiment is provided with the metal block 33 and the metal piece 32 instead of the metal piece 12 shown in drawing 1. The metal block 33 is really formed in shape which loaded two disks of a concentric circle with which radii differ, a notch is provided so that the inclined plane S1 where the side becomes low toward a center may be made to a top disk part, and LED22 is laid in the bottom. LED22 adheres to the bottom of a notch with the electroconductive glue 24, and is electrically connected with the metal block 33. The pars basilaris ossis occipitalis of the metal block 33 has disc shape with a larger radius than a crowning, and the radius is the same in the translucency resin molded body 16 and abbreviation in this embodiment. The light blocking effect resin molded body 36 is formed so that the pars basilaris ossis occipitalis of the metal

block 33 may project from the bottom. While the metal block 33 is connected to the wiring on the substrate which is not illustrated in the bottom with such shape, The heat generated in LED22 is efficiently emitted by the gap between the bottom and the substrate except a field corresponding to the big area of base of the metal block 33, and the mounting region of the light blocking effect resin molded body 36.

[0040]The light from which it separated from the optic axis of LED22 reflects by the inclined plane S1 formed in the notch of the crowning of the metal block 33, and it enters into the translucency resin molded body 16, and emanates to the exterior on an orbit almost parallel to an optic axis.

[0041]The inside has the inclination shape which becomes low toward a center, a reflector is applied to the surface S2, and the flank of the light blocking effect resin molded body 36 serves as a white glossy surface, as shown in drawing 2 (b). Therefore, the light from which it separated from the optic axis reflects, and this inclined plane S2 also emanates on an orbit parallel to an optic axis via the translucency resin molded body 16.

[0042]Although the cathode of LED22 had composition connected to wiring on a substrate via the metal block 33 in this embodiment, Without restricting to this, as shown in the dashed line of the figure, corresponding to the design of the substrate mounted, even if the top adjacent spaces of the metal block 33 and the tip part of the metal piece 32 are connected with the metal wire 27 and it connects with wiring on a substrate by the end of the package outside of the metal piece 32, it is easy to be natural.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1]It is an explanatory view of a 1st embodiment of the optical semiconductor package concerning this invention.

[Drawing 2]It is an explanatory view of a 2nd embodiment of the optical semiconductor package concerning this invention.

[Drawing 3]It is the front view and enlarged drawing showing an example of the optical semiconductor package by a Prior art.

[Description of Notations]

1, 2 optical semiconductor packages

11, 12, 31, and 32 Metal piece

13 and 34 Leadframe

14 and 36 Light blocking effect resin molded body (the 1st resin molded body)

16 Translucency resin molded body (the 2nd resin molded body)

22 OPTO semiconductor device (LED)

24 Electroconductive glue

26, 27 metal wires

S1 and S2 Inclined plane

---

[Translation done.]



\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

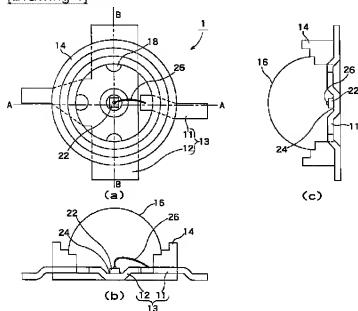
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

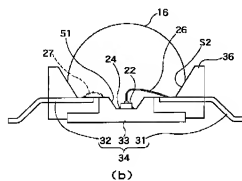
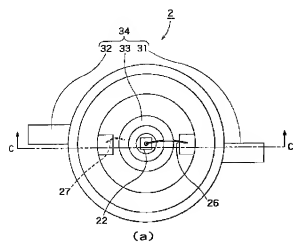
**DRAWINGS**

---

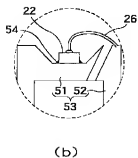
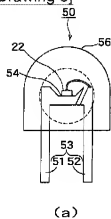
[Drawing 1]



[Drawing 2]



[Drawing 3]



---

[Translation done.]